

**Lesson Title:** Cell Structure and Function Analogy

**Learning Objectives/Goals:**

1. Students will be able to compare and contrast plant and animal cells based on the structures that make up each cell. (F.12.1) (NETS 3.b, 3.c)
2. Students will be able to identify the structures of each type of cell using the microscope in the laboratory. (C.12.6) (NETS 4.c)
3. Students will create an analogy for a plant or animal cell. (B.12.4) (NETS 3.b,3.c)
4. Students will design an electronic poster representing their analogy with an explanation for each organelle. (G.12.2) (NETS 1. c.)

**Wisconsin Science Standards**

B.12.4 Show how basic research and applied research contribute to new discoveries, inventions, and applications

C.12.6 Present the results of investigations\* to groups concerned with the issues, explaining\* the meaning and implications of the results, and answering questions in terms the audience can understand

F.12.1 Evaluate the normal structures and the general and special functions of cells in single-celled and multiple-celled organisms

G.12.2 Design, build, evaluate, and revise models and explanations related to the earth and space, life and environmental, and physical sciences

**NETS Standards**

1. c. Use models and simulations to explore complex systems and issues
2. b. Communicate information and ideas effectively to multiple audiences using a variety of media and formats
3. b. Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media
3. c. Evaluate and select information sources and digital tools based on the appropriateness to specific tasks
4. c. Collect and analyze data to identify solutions and/or make informed decisions

### Instructional Strategies

1. Asynchronous presentation of organelles
2. Practice analogy (Cell City Analogy)
3. Discussion Board Postings for Project
4. Using web-based resources, students will create their own analogy of the cell for the organelles in presentation
5. Students will view real-life plant and animal cells in the laboratory to reinforce organelles
6. Read plant cell article and reply to discussion question

### Tier I, II, and III Intervention Strategies

Tier I	Tier II	Tier III
<ul style="list-style-type: none"><li>- Provide notes for students with audio</li><li>- Accept analogy with less total organelles of the cell</li><li>- Accept oral explanation of analogy</li><li>- Allow partner for analogy</li><li>- Review session via live conferencing</li></ul>	<ul style="list-style-type: none"><li>- Perform plant and animal laboratory using simulation</li><li>- Accept analogy poster and explanation done in handwriting</li><li>- Demonstrate lab in real time so students using a document camera</li></ul>	<ul style="list-style-type: none"><li>- Speech to text screen reader for notes presentation</li><li>-Screen Magnifier for research and presentations</li></ul>

### Readings and Web Resources

- Cells Alive website: <http://www.cellsalive.com/cells/3dcell.htm>
- Cell Organelle Chart: [http://www.biologyjunction.com/cell\\_functions.htm](http://www.biologyjunction.com/cell_functions.htm)
- Plant and Animal Cell Comparison: <http://waynesword.palomar.edu/lmexer1a.htm>
- (Article) Amoeba May Offer Key Clue to Photosynthetic Evolution: <http://www.sciencedaily.com/releases/2012/02/120227152819.htm>

### Discussion Board Requirements

1. In our f2f discussion today you received a Cell Analogy assignment where you must create your own analogy for all of the cell structures we have learned in class. You must provide an electronic illustration of your analogy using a tool of your choice. What is the idea you are using to create your analogy (ex. school, grocery store) and what tool are you using to create your illustration? Reply by Wednesday this week. Remember, everyone must have an original analogy (no repeats) so the earlier you post the better.

You are not required to reply to any postings, but use this forum to help each other out by sharing ideas and tools with others in class. Feel free to reach out to your classmates if you have a question regarding technology or the accuracy of your analogy. Remember to keep all postings appropriate and use proper netiquette.

2. Once you have completed your electronic analogy of the cell provide the link or upload your illustration to the discussion board by Sunday at midnight. Be sure to include your name

and what idea you used to create your analogy. You are required to view 2 of your classmates' analogies and provide constructive feedback to them by replying to their initial post by Wednesday. Remember to keep all postings appropriate and use proper netiquette.

Feel free to use this discussion forum as a study tool for the quiz you will be having on cell structures and functions.

3. When reading the article on photosynthetic evolution it discussed an Amoeba. We have not discussed an Amoeba in class yet, but based on the reading what is an Amoeba and how would you classify it? What is the relationship between an Amoeba and the evolution of photosynthesis occurring in plant cells?

#### Extension Activities

Low	Middle	High
-Extra Practice Activity (Widget Analogy) -More than required organelles in analogy	- Research for further articles on new findings in plant and animal cells -More than required organelles in analogy	-Further research on plant and animal cells -View and classify bacteria in the laboratory - More than required organelles in analogy

#### Class Materials:

##### 1. Extra Practice Analogy Widget Analogy

#### Cell City Analogy

In a faraway city called Grant City, the main export and production product is the steel widget. Everyone in the town has something to do with steel widget making and the entire town is designed to build and export widgets. The town hall has the instructions for widget making, widgets come in all shapes and sizes and any citizen of Grant can get the instructions and begin making their own widgets. Widgets are generally produced in small shops around the city, these small shops can be built by the carpenter's union (whose headquarters are in town hall).

After the widget is constructed, they are placed on special carts which can deliver the widget anywhere in the city. In order for a widget to be exported, the carts take the widget to the postal office, where the widgets are packaged and labeled for export. Sometimes widgets don't turn out right, and the "rejects" are sent to the scrap yard where they are broken down for parts or destroyed altogether. The town powers the widget shops and carts from a hydraulic dam that is in the city. The entire city is enclosed by a large wooden fence, only the postal trucks (and citizens with proper passports) are allowed outside the city.

Match the parts of the city (underlined) with the parts of the cell.

1. Mitochondria \_\_\_\_\_
2. Ribosomes \_\_\_\_\_
3. Nucleus \_\_\_\_\_
4. Endoplasmic Reticulum \_\_\_\_\_
5. Golgi Apparatus \_\_\_\_\_
6. Protein \_\_\_\_\_
7. Cell Membrane \_\_\_\_\_
8. Lysosomes \_\_\_\_\_
9. Nucleolus \_\_\_\_\_

## **2. Cell Analogy Project**

### **Introduction**

Cells need to carry on the same basic functions as we do to sustain life; the difference is cells do this with much smaller parts. These smaller structures that allow the cell to function are called organelles – “tiny organs.” Also plant and animal cells have some similar parts and some parts that are not similar. It’s only common sense that if you are able to relate things you learned in class to everyday things, you’ll remember it better. It’s not everyday that you and your friends sit around at Starbucks discussing the rough endoplasmic reticulum. However, you probably do discuss things like cars, your homes, places to visit, etc... Therefore, your task in this assignment is to relate the different cell organelles to an everyday situation or thing using an analogy.

### **Your Task**

You will come up with an analogy for the cell of your choice and its organelles. Your analogy will be represented in the form of an electronic poster that represents a cell and its organelles. You should compare roles of 10 organelles to a part of the analogy.

### **Example: the Cell City**

- The nucleus of a cell is the main control center of the cell. It holds all of the information needed for the cell to function properly. Therefore, it is like city hall because this is where the information, policy and governing is done to run the city.
- The mitochondria of a cell are where energy (ATP) is created through the breakdown of glucose (fuel) in a process known as cellular respiration. In a city, the power plant would be similar to a mitochondria because this is where electricity (energy) is made from fuel (coal) in a process known as combustion.

### **The Electronic Poster**

To create the electronic poster use either Glogster [glogster.com](http://glogster.com) or Google drawing You should have a well drawn or constructed visual of your analogy (i.e. if you were doing a cell city, you would have a picture of a city and each of the parts of your analogy), and short 2-3 sentence descriptions of each organelle analogy (like shown above). The description can be done in a word document and sent via email to [czellner@wdpsd.com](mailto:czellner@wdpsd.com). Be sure to include the website address for your poster in the email.

## Grading

Your poster will be evaluated according to the following criteria on a scale from 1 to 5. A “1” would mean that you did not meet my expectations for that section of the project. A “5” would mean that you went above and beyond and exceeded my expectations on that section of the project. A five will only be given if that specific section is exceptionally good! Use these categories below before you finalize your poster to make sure you have met all of the requirements!

### Grading Categories

**1. Accuracy and Clarity of Analogy (10 points).** Does the analogy make sense? Are all of the organelles included? Are the descriptions of each analogy clear and complete? Are the descriptions of each analogy of the required length? Make sure you include the following organelles:

- |                                |                                 |                          |
|--------------------------------|---------------------------------|--------------------------|
| a. plasma membrane             | f. smooth endoplasmic reticulum |                          |
| b. nucleus                     | g. golgi apparatus              | k. nucleolus             |
| c. lysosome                    | h. mitochondria                 | l. cell wall             |
| d. ribosome                    | i. chloroplast                  | m. cytoplasm             |
| e. rough endoplasmic reticulum | j. vacuole                      | n. cilia and/or flagella |

**2. Creativity (10 points).** Is your analogy creative? For a project with average creativity, you will receive an average score. If you choose to do “A Cell City” you will receive 0 points for this section, as I already gave you that idea.

**3. Completion & Organization (5 points).** Does your project include all of the necessary parts? Is it organized? Does it show a high amount of effort?

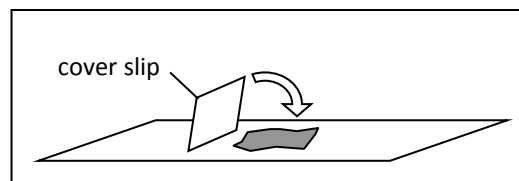
### 3. Cell Laboratory

#### Onion Cells Lab

**Background:** Onion tissue provides excellent cells to study under the microscope. The main cell structures are easy to see when viewed with the microscope at medium power. For example, you will observe a large circular **nucleus** in each cell, which contains the genetic material for the cell. In each nucleus, are round bodies called **nucleoli**. Also present in the onion cell, is a well developed **cell wall** and a **cell membrane** just beneath it.

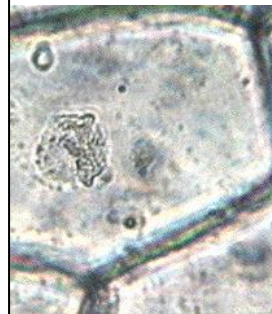
**Purpose:** To study the structure of the onion epidermal cell, with particular emphasis on the cellular organelles.

**Materials:** onion, microscope, glass slide, cover slip, iodine stain (**Note:** iodine is toxic and will stain - handle with care).



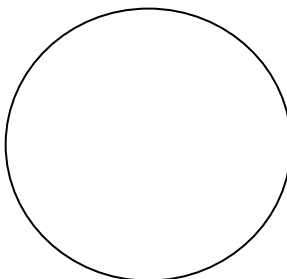
#### Procedure:

1. Obtain a clean slide and place a single layer of onion cell membrane onto the slide. **(Do Not Fold the Membrane or wrinkle it!!!)**
2. Place 1 drop of iodine stain on your onion tissue.
3. Put the coverslip on the stained tissue and gently tap any air bubbles out **(Don't smush the tissue)**
4. Start viewing the slide under low power (4x).
5. Once you focus under low power, use the 10x and 40x objectives to get a closer view.
6. Complete the following questions with your lab partner.
7. Clean Lab station:
  - a. Clean slide and cover slip **(Don't Throw Away)**
  - b. Turn off microscope
  - c. Unplug and roll up cord



#### Questions and Observations:

1. Is the membrane (skin) composed of one or many cells? \_\_\_\_\_
2. What is the general shape of these cells? Compare the shape to the cheek cells.
3. Did onion or cheek cells seem to be aligned in a more regular pattern? Why?
4. Make a sketch of a few cells as seen under high power. Draw and label structures seen.



5. What structures do the onion cells have that the cheek cells we previously viewed didn't have?

6. The onion cell is a plant cell but it didn't it have chloroplasts and chlorophyll which would make it appear to be green. Why?

7. Are the onion cells you viewed prokaryotic or eukaryotic? How do you know?

### The Human Cheek Cell

1. List the 3 parts of the Cell Theory.

2. Describe or define each of the following:

--plasma membrane

--cytoplasm

--nucleus

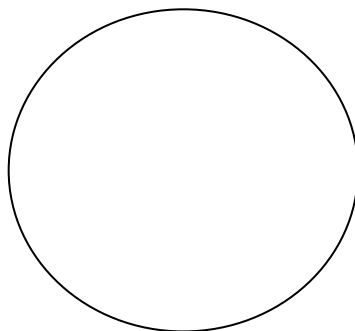
--organelle

#### Procedure:

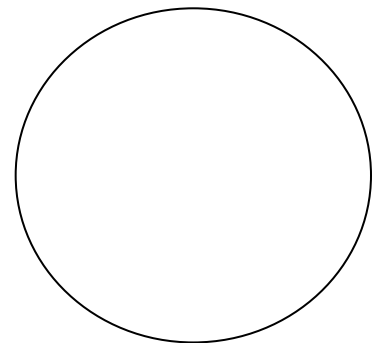
1. Add one drop of Methylene Blue Dye to the middle of a clean slide. Be careful, it will stain your clothes!!!!!!
2. Use the flat end of the toothpick to gently scrape the inside of your cheek. DO NOT GOUGE YOUR CHEEK!!!!
3. Gently put the end of the toothpick you used to scrap your cheek into the dye and swirl. Toss the toothpick.
4. Place a coverslip onto the slide
5. Use the SCANNING objective to view the cells. You probably won't see them yet.
6. Switch to low power. Cells should be visible, but will be small and look like blobs. Anything very dark purple is not a cell.
7. When locating a cell, switch to high power and refocus. (Do Not use coarse adjustment at this time)

3. **Sketch** the cell at low and high power. Label the nucleus, cytoplasm, and plasma membrane. Draw your cells to scale.

**Low Power**



**High Power**



4. What do you think was the purpose of the Methylene Blue stain?

5. Describe the shape of the cheek cells? Were they irregular or regular shaped?

6. Is the cheek cell prokaryotic or eukaryotic? How do you know?

7. List 2 organelles that were not visible but should have been in the cheek cell.